Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
Tel : +91 - 261 - 2227141 to 2227146, Toll Free : 1800 2333 011, Digital Helpline No.- 0261 2388888
E-mail : info@vnsgu.ac.in, Website : www.vnsgu.ac.in

–: પરિપત્ર :–

યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવેલ B.Sc. Medical Laboratory Technology Sem.-1 & 2 ના અભ્યાસક્રમના PSO અને CO અંગે મેડિકલ ટેકનોલોજી વિષયની અભ્યાસ સમિતિની તા.૨૬/૦૪/૨૦૨૫ની સભાના ઠરાવ ક્રમાંકઃ૦૪ થી કરેલ ભલામણ સ્વીકારી વિજ્ઞાન વિદ્યાશાખાની તા.૩૦/૦૪/૨૦૨૫ની સભાનાં ઠરાવ ક્રમાંકઃ૪૪ થી કરેલ ભલામણ સ્વીકારી એકેડેમિક કાઉન્સિલની તા.૦૫/૦૫/૨૦૨૫ ની સભાનાં ઠરાવ ક્રમાંકઃ૧૦૮ થી મંજુર કરેલ છે. જે સંદર્ભે સદર PSO અને CO સાથેના અભ્યાસક્રમનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

બિડાણઃ ઉપર મુજબ

ક્રમાંકઃઓથો./પરિપત્ર/સિલેબસ/૧૨૧૮૭/૨૦૨૫
તા.૦૨–૦૬–૨૦૨૫

કુલસચિવ (I/c)

પ્રતિ,
૧) યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓ.
.....આપશ્રીની કોલેજના સંબંધિત શિક્ષકોને જાણ કરી અમલ કરવા સારૂ.
૨) ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા.
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
.....તરફ જાણ તેમજ અમલ સારૂ.

Academic Council 05-05-2025
Item No. 108 Encl. 92

Veer Narmad South Gujarat University, Surat

Syllabus of

B. Sc. Medical Laboratory Technology

(As per NEP- 2020)

Effective from 2023 - 2024

B. Sc. Medical Laboratory Technology

Title of the Program: B. Sc. Medical Laboratory Technology

Eligibility: 12th Science

Duration: 3 years (Degree) /4 years (Honours/ Honours with Research)

Medium of Instruction: English

Program Outcome:

PO-01: Scientific Knowledge & Conceptual Understanding

Develop a strong foundation in scientific principles, theories and concepts across disciplines, fostering interdisciplinary learning, advance knowledge and problem-solving abilities.

PO-02: Analytical & Critical Thinking

Apply critical thinking and analytical reasoning to evaluate scientific data, hypotheses and real-world problems, leading to evidence-based conclusions.

PO-03: Research & Inquiry-based Learning

Develop investigative skills through experimentation, data analysis and scientific inquiry to contribute to research and innovation.

PO-04: Laboratory & Technical Skills

Gain hands-on experience with laboratory techniques, instrumentation and computational tools relevant to scientific research and industry applications.

PO-05: Digital & Computational Literacy

Utilize digital tools, computational techniques and emerging technologies such as AI, bioinformatics and statistical modelling to enhance scientific learning and problem-solving.

PO-06: Environmental & Societal Responsibility

Understand the role of science in addressing environmental, health and societal challenges, promoting sustainability and ethical responsibility.

PO-07: Effective Communication & Collaboration

Develop proficiency in scientific communication, both written and oral, for effective dissemination of knowledge while collaborating in multidisciplinary teams.

PO-08: Innovation & Entrepreneurship

Foster an entrepreneurial mind-set by applying scientific knowledge for innovation, technology development, and industry-oriented applications. Develop sustainable solutions to address real-world challenges in research and environmental management.

PO-09: Lifelong Learning & Professional Growth

Cultivate curiosity and adaptability for continuous learning, equipping students for higher education, research, and professional careers.

PO-10: Ethical Leadership & Value-based Education

Develop leadership qualities, ethical values, and a sense of responsibility in applying science for societal progress, aligning with Indian knowledge systems and global perspectives.

Program Specific Outcome:

The B. Sc. Medical Laboratory Technology (MLT) program is designed to equip students with the knowledge, skills, and practical expertise to work in various healthcare and diagnostic laboratory settings. The program focuses on medical laboratory sciences, providing comprehensive training in different laboratory departments, and prepares students to handle diagnostic procedures, laboratory equipment, and patient sample analysis. Upon successful completion of the B. Sc. MLT programme, graduates will be able to:

PSO 1: Fundamental knowledge of human health science
To have basic introductory knowledge and understanding of basic concepts in human anatomy physiology, microbiology, immunology, pathology, parasitology, biochemistry, haematology, blood banking, haematology, histo-cytology, lab organization and lab management and various instruments and equipment of clinical laboratory.

PSO 2: Analytical and technical knowledge & expertise for patient care
Demonstrate proficiency in performing laboratory tests in disciplines such as haematology, clinical biochemistry, microbiology, immunology, pathology, parasitology, blood banking and molecular diagnostics to support accurate diagnosis and treatment of diseases. Utilize advanced analytical skills to interpret laboratory findings accurately and correlate results with clinical conditions to improve patient care.

PSO 3: Quality work and safe laboratory environment
Students will understand laboratory safety protocols and the importance of maintaining high standards of accuracy and precision in diagnostic testing.

PSO 4: Ethical and Professional Conduct
Adhere to professional ethics, confidentiality, and legal standards while performing laboratory procedures and handling patient information.

PSO 5: Communication and Teamwork
Exhibit effective communication skills to collaborate with healthcare professionals, ensuring timely and accurate delivery of laboratory results for clinical decision-making.

PSO 6: Perpetual Learning and skill enhancement
Commit to lifelong learning by updating knowledge in emerging trends, technologies, and advancements in medical laboratory sciences for continuous professional development.

PSO 7: Professional Competence
Graduates will be well-prepared to execute their work in clinical laboratories, hospital laboratories, public health organizations, research institutions, and medical device companies, and contribute to advancements in medical diagnostics and patient care.

PSO 8: Laboratory management and Quality Control
Apply knowledge of laboratory management principles, including quality control, equipment maintenance and inventory control to ensure efficient and effective laboratory operations.

PSO 9: Research and Innovation
Engage in scientific research, contributing to the development of innovative diagnostic techniques, improved testing methods, and advancements in medical laboratory science.

PSO 10: Entrepreneur skill
The student can empower their skill and scientific knowledge involving healthcare-minded individuals creating new businesses, services or solutions to address unmet needs or improve healthcare delivery, often through innovation and a focus on patients-centric care.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

B. Sc. Medical Laboratory Technology Major

Course Structure of Semester I & II

SEMESTER – I							
Course Code	**Title of The Course**	**Course Credit**	**Hrs. Per Week**	**Internal Exam Marks (CCE)**	**External Exam Marks (SEE)**	**Duration of External Exam (Hr.)**	**Total Marks**
MLT-MJ-101	Fundamentals of Medical Laboratory Technology	03	03	37	38	01:30	75
MLT-MJ-102	Human Anatomy	03	03	37	38	01:30	75
MLTP-MJ-101	Practicals Based on Fundamentals of Medical Laboratory Technology	01	02	12	13	03	25
MLTP-MJ-102	Practicals Based on Human Anatomy	01	02	12	13	03	25
	Total	08	10	98	102		200
SEMESTER – II							
MLT-MJ-201	Laboratory Specimens	03	03	37	38	01:30	75
MLT-MJ-202	Laboratory Instruments and Equipments	03	03	37	38	01:30	75
MLTP-MJ-201	Practicals Based on Laboratory Specimens	01	02	12	13	03	25
MLTP-MJ-202	Practicals Based on Laboratory Instruments and Equipments	01	02	12	13	03	25
	Total	08	10	98	102		200

SEMESTER I

MLT-MJ-101: FUNDAMENTALS OF MEDICAL LABORATORY TECHNOLOGY

Semester: I	
Course Code	MLT-MJ-101
Course Title	Fundamentals of Medical Laboratory Technology
Course Type	Major
Credit	3
Course Level	100-199
Teaching Hour/ Week	3 Hours
Teaching Time	15×3= 45 Hours
Course Objective	• To understand the various aspects of a medical laboratory. • To understand proper techniques for specimen handling and processing so as to obtain accurate results • To understand the importance of Quality control and Quality assurance. • To understand the role and functions of a medical laboratory technician.
Course Outcome	At the end of the course, the students will get knowledge of **CO1 -** Basics of clinical laboratory, Standard clinical laboratory set up and its types, Different types of glassware, its use and calibration. **CO2 -** Basics of clinical laboratory organization, Laboratory Ethics and Code of safe laboratory practice **CO3 -** Laboratory hazards and safety, First-Aid in clinical laboratory, Biosafety levels and Biosafety programs.

Mapping between Cos and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	■	■					■			
CO2				■	■			■		
CO3			■	■		■				

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Introduction to Clinical Laboratory**	**15 Hr.**
1.1	Introduction: Health disease-health Cycle	
1.2	Functional Components and Role of Individual Components of Clinical Laboratory	
1.3	A Standardized Clinical Laboratory Set Up	
1.4	Various Types of Laboratories and Commonly Requested Laboratory Tests in India and other Developing Countries	
1.5	Introduction to Laboratory wares: Glassware, Plastic wares and Accessories	
Unit-2	**Laboratory Organization and Ethics**	**15 Hr.**
2.1	Organization of Clinical Laboratory	
2.2	Responsibilities of Medical Laboratory Technologist	
2.3	Factors reducing and increasing productivity of a Laboratory	
2.4	Professional Ethics and Code of Conduct for Medical Laboratory Professional	
2.5	Medico-Legal Aspects of Clinical Practice	
Unit-3	**Laboratory Accidents and Safety**	**15 Hr.**

3.1	Laboratory Hazards- Physical, Chemical and Biological, Accidents and Safety Measures in Clinical Laboratory	
3.2	Code of Safe Laboratory Practice	
3.3	First Aid in Laboratory	
3.4	Biosafety Level and Biosafety Programme	
3.5	Universal work precautions for Laboratory Personnel	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Science - Theory and Practice	J. Ochei & A Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi
4	District Laboratory Practice in Tropical Countries, Part 1, 2nd Edition	Monica Cheesbrough	Cambridge University Press
5	Medical Laboratory Technology Methods and Interpretations, Volume 1, 6th Edition	Ramnik Sood	Jaypee Brothers Medical Publishers (P) LTD
6	Manual of Basic Techniques for a Health Laboratory	WHO	World Health Organization (2003)

MLT-MJ-102: HUMAN ANATOMY

Semester: I	
Course Code	MLT-MJ-102
Course Title	Human Anatomy
Course Type	Major
Credit	3
Course Level	100-199
Teaching Hour/ Week	3 Hours
Teaching Time	15×3= 45 Hours
Course Objective	• To understand human body. • To understand the organization of human body beginning from cells to tissues to organs to systems • To understand the important anatomical systems alongwith the organs involved in its normal functioning. • To understand the different body parts and the different organs of human body
Course Outcome	At the end of the course, the students will get knowledge of **CO1 -** Cell structure, cell organelles, cell cycle and cellular organization leading to formation of different tissues. **CO2** - The structure, composition and function of digestive system and genitourinary system and their functioning in a normal human being. **CO3** - Components and functions of Respiratory system and Central Nervous system.

Mapping between Cos and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	■									
CO2		■					■			
CO3		■					■			

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Cells & Tissues**	**15 Hr.**
1.1	Cell - structure & function Plasma Membrane Cell Organelles Cell Cycle Transport of Substance across cell membrane	
1.2	Tissues 1.2.1 Epithelial Tissue 1.2.2 Connective Tissue 1.2.3 Muscular Tissue 1.2.4 Nervous Tissue	
Unit-2	**Digestive System and Genitourinary System**	**15 Hr.**
2.1	Digestive System 2.1.1 Components and function 2.1.2 Basic anatomy and Function of Alimentary Organs: Salivary Gland, Stomach, Small Intestine, Large Intestine 2.1.3 Basic anatomy of Accessary organs: Pancreas, Liver and Biliary Tract	
2.2	Genitourinary System	

	2.2.1 Components and function of Urinary System and Reproductive System 2.2.2 Basic anatomy of Kidney and associated organs 2.2.3 Basic anatomy of Male reproductive organs, Female reproductive organs	
Unit-3	**Respiratory and Central Nervous System**	**15 Hr.**
3.1	Respiratory System 3.1.1 Components and function of Respiratory System 3.1.2 Basic anatomy of Upper Respiratory Tract organs: Nose, Larynx, Pharynx, Trachea 3.1.3 Basic anatomy of Lower Respiratory Tract organs: Bronchi, Bronchioles and Alveoli and Lungs	
3.2	Central Nervous System 3.2.1 Components and function of Central Nervous System 3.2.2 Basic anatomy of Brain: Cerebrum, Thalamus, Hypothalamus, Mid Brain, Pons, Medula oblongata and Cerebellum 3.2.3 Basic anatomy of Spinal Cord	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Anatomy & Physiology in health & illness,11th edition, (2014)	Ross & Wilson	Elsevier Publications
2	Principles of Anatomy and Physiology,14th edition,	Gerard J. Tortora and Bryan H. Derrickson	Wiley Publications
3	Basics in Human Anatomy for B.Sc. Paramedical Courses 1st edition (2008)	Priya Ranganath, Leelavathy N	Jaypee Publishers
4	Textbook of Physiology for MLT, 1st edition (2016)	A. K. Jain	Avichal Publishing Company
5	Human Anatomy, 7th edition (2016)	Chaurasia B D	CBS Publishers

MLTP-MJ-101: PRACTICALS BASED ON FUNDAMENTALS OF MEDICAL LABORATORY TECHNOLOGY

Semester: I	
Course Code	MLTP-MJ-101
Credit	01
Teaching Hour/ Week	2 Hours
Course Title	Practicals Based on Fundamentals of Medical Laboratory Technology
Course Objectives	• This course equips students with the knowledge and technical skills necessary for working in diagnostic and research laboratories. • To Develop skills for the ethical performance as a laboratory technician**,** to perform and Interpret Laboratory Results, to Correlate Test Results with Clinical Conditions. • To Implement appropriate quality control measures to maintain accuracy and reliability in laboratory testing. • To Utilize acquired skills to contribute effectively to clinical laboratories, research institutions, and healthcare settings.
Course Outcome	At the end of the course, the students will be able to understand • **CO 1 to 7 –** different types of laboratory glasswares, its cleaning, calibration of glasswares, laboratory hazards and the first-aid measures for a clinical laboratory.
Mapping between Cos and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1-7										

Course Content

1. Study of Laboratory Glassware
2. Cleaning of New Laboratory Glassware
3. Cleaning of Old Laboratory Glassware
4. Calibration of 1 ml, 5 ml pipette
5. Study of Laboratory Hazards
6. Prevention of Laboratory Hazards
7. First Aid measures in Clinical Laboratory

Reference Books:

Sr. No.	**Title/Edition**	**Authors**	**Publisher**
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Technology Methods and Interpretations, Volume 1, 6th Edition	Ramnik Sood	Jaypee Brothers Medical Publishers (P) LTD
4	Anatomy & Physiology in health & illness,11th edition, (2014)	Ross & Wilson	Elsevier Publications
5	Principles of Anatomy and Physiology,14th edition,	Gerard J. Tortora and Bryan H. Derrickson	Wiley Publications

MLTP-MJ-102: PRACTICALS BASED ON HUMAN ANATOMY

Semester: I	
Course Code	MLTP-MJ-102
Credit	01
Teaching Hour/ Week	2 Hours
Course Title	Practicals Based on Human Anatomy
Course Objectives	• This course equips students with the knowledge of human anatomy. • It teaches students about the organization of different systems of human body. • It helps to understand the different types of cells, tissues and organs of human body
Course Outcome	At the end of the course, the students will able to, **CO 1 to 10 -** Recognize the anatomical structures of Cell, Tissues, Organs and System of Human body.
Mapping between Cos and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1-10										

Course Content

1. Cell Structure Study from models/charts/ Diagram
2. Study of Epithelial Tissue from models/charts/ Diagram
3. Study of Nervous Tissue from models/charts/ Diagram
4. Study of Connective Tissue from models/charts/ Diagram
5. Study of Muscular Tissue from models/charts/ Diagram
6. Demonstration of respiratory system from models/charts/ Diagram / Diagram
7. Demonstration of digestive system from models/charts/ Diagram
8. Demonstration of urinary system from models/charts/ Diagram
9. Demonstration of nervous system from models/charts/ Diagram
10. Demonstration of reproductive system from models/charts/ Diagram

Reference Books:

Sr. No.	**Title/Edition**	**Authors**	**Publisher**
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Technology Methods and Interpretations, Volume 1, 6th Edition	Ramnik Sood	Jaypee Brothers Medical Publishers (P) LTD
4	Anatomy & Physiology in health & illness,11th edition, (2014)	Ross & Wilson	Elsevier Publications
5	Principles of Anatomy and Physiology,14th edition,	Gerard J. Tortora and Bryan H. Derrickson	Wiley Publications

SEMESTER II

MLT-MJ-201: LABORATORY SPECIMENS

Semester: II	
Course Code	MLT-MJ-201
Course Title	Laboratory Specimens
Course Type	Major
Credit	3
Course Level	100-199
Teaching Hour/ Week	3 Hours
Teaching Time	15×3= 45 Hours
Course Objective	• To make students learn the procedure of blood collection and its processing. • To make them aware of the responsibilities of a phlebotomist. • To make them understand the procedure of collection, preservation and transport of various clinical specimens like urine, stool, sputum, throat, pus from eye and ears, etc. • To impart knowledge about classification of the biochemical waste in various categories and segregate them easily. • To explain then the treatment and disposal of biochemical waste.
Course Outcome	At the end of course students will get knowledge of **CO-1:** Basics of theoretical aspects of collection, preservation and transport of blood. They will be clear about the responsibilities and role of a phlebotomist. Also they will be able to select and reject the specimens for the laboratory investigations. **CO-2:**Collection, preservation, transport and storage of other clinical specimens including urine, urogenital specimens, stool, sputum, throat, pus from ear and eye specimens, etc. **CO-3:** Segregation of the biomedical waste. They will learn the methods for treatment and disposal of various laboratory specimens and other biomedical waste generated in the laboratory.

Mapping between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1-2										
CO3										

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Blood**	**15 Hr.**
1.1	Preparation of material and patient for blood collection	
1.2	Vacutainer system	
1.3	Responsibilities of a Phlebotomist	
1.4	Blood collection procedure: Venipuncture and Capillary puncture and Specimen rejection criteria	
1.5	Processing, Storage and Transportation of blood	
Unit-2	**Urine and Stool Specimen**	**15 Hr.**
2.1	Urine 2.1.1 Container for collection 2.1.2 Collection method and types: Collection for a) Screening b)	

	Quantitative analysis c) Bacteriological examination d) Special collection Techniques 2.1.3 Preservation, Storage and Transportation of Urine	
2.2	Stool 2.2.1 Container for collection 2.2.2 Collection method 2.2.3 Preservation and Transportation	
2.3	**Miscellaneous Specimen** (Collection, Preservation and Transportation) 2.3.1 Sputum 2.3.2 Throat and Mouth specimen 2.3.3 Urogenital specimen 2.3.4 Pus, Eye and Ear specimen	
Unit-3	**Biomedical Waste Management**	**15 Hr.**
3.1	Introduction and Classification	
3.2	Segregation of BMW	
3.3	Treatment of BMW	
3.4	Disposal of BMW	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd ed., (2014)	Godkar P. B.	Bhalani Publishing House.
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Clinical Diagnosis and Management by Laboratory Methods/17th	John Bernard Henry	W. B. Saunders Company
4	Medical Microbiology and Parasitology/4th	B. S. Nagoba Asha Pichare	ELSEVIER

MLT-MJ-202: LABORATORY INSTRUMENTS AND EQUIPMENTS

Semester: II	
Course Code	MLT-MJ-202
Course Title	Laboratory Instruments and Equipments
Course Type	Major
Credit	3
Course Level	100-199
Teaching Hour/ Week	3 Hours
Teaching Time	15×3= 45 Hours
Course Objective	• To study the basic terminologies of microscopy. • To learn various parts of the simple and compound microscope, its operation, care and maintenance. • To understand the principle, components, operation and use of various laboratory instruments and equipments like pH meter, colorimeter, centrifuge, weighing balance and incubator. • To impart knowledge about method of sterilization using instruments like Autoclave and Hot air oven.
Course Outcome	At the end of course students will be able to **CO-1:** Understand the basic terminologies of microscopy, gain knowledge regarding various parts of the simple and compound microscope, its operation, care and maintenance. **CO-2:**Learn the working principle, components and operation and care and maintenance of various laboratory instruments and equipments like pH meter and colorimeter. This will benefit them to adjust the pH of the any solution to fulfil the requirement. They will also be able to understand how to take the optical densities of any solution to find concentration of substances in a solution. **CO-3:** Perceive the knowledge of process of sterilization of various equipments, glassware and medias by learning the principle, working, and operation of Autoclave and Hot air oven. This will help them to employ the concept of moist heat and dry heat sterilization. Also they will be able to handle and use the instruments like weighing balance, centrifuge and incubator.
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1-3										

Course Content:

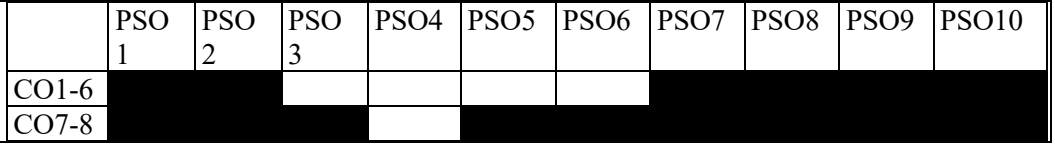
Unit No.	Content	Teaching Hours
Unit-1	**Microscope**	**15 Hr.**
1.1	Introduction and Properties of light	
1.2	Basic terminologies: Refraction and refractive Index, magnification, Numerical aperture, Resolution and Resolving power	
1.3	Components, working principle and operation of Bright field microscope	
1.4	Care and maintenance of microscope	
Unit-2	**pH meter and Colorimeter**	**15 Hr.**
2.1	pH meter 2.1.1 Principle and use	

	2.1.2 Component 2.1.3 Care and maintenance	
2.2	Colorimeter 2.2.1 Principle and use 2.2.2 Component 2.2.3 Care and maintenance	
Unit-3	**Other Laboratory Instruments**	**15 Hr.**
3.1	Equipments of Sterilization**:** Autoclave and Hot Air Oven	
3.2	Weighing balance	
3.3	Centrifuge	
3.4	Incubator	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Elementary Microbiology, Fundamentals of Microbiology, Vol-1	H.A. Modi	Akta Prakashan, Nadiad
2	Prescott's Microbiology, 10th edition	Willey. J.M, Sherwood L.M and Woolverton C.J., (2017)	McGraw- Hill Education
3	Medical Laboratory Science- Theory and Practice	A.Kolhatkar , J Ochei.	Tata McGraw- Bhalani Pub.
4	Textbook of Medical Laboratory Technology/ 3rd	P. B. Godkar, D.P. Godkar.	Bhalani Publishing House Mumbai, India
5	Elements of Microbiology, 2nd edition	D. Darji	Nirav Prakashan, Ahmedabad

MLTP-MJ-201: PRACTICALS BASED ON LABORATORY SPECIMENS

Semester: II	
Course Code	MLTP-MJ-201
Credit	01
Teaching Hour/ Week	2 Hours
Course Title	Practicals Based on Laboratory Specimens
Course Objective	• To develop the knowledge of the collection of various laboratory specimens • The students will learn to separate serum and plasma from blood • This section is designed to make them aware about the transportation and storage of various laboratory specimens. • To spread awareness to evaluate the BMW, to get idea about its treatment and will also learn the proper method of waste disposal of wastes generated in the laboratory.
Course Outcome	At the end of course students will be **CO-1-2:** Trained to collect blood through venipuncture and capillary puncture technique. **CO-3-4:** Able to separate plasma and serum from blood. Will be able to differentiate serum from plasma and will be aware of the anticoagulant's role in preparation of plasma. **CO-5-6:** Collect, store and get idea about transportation of clinical specimens including Urine, Stool, Sputum, Throat and Mouth specimen, Urogenital specimen, Pus, Eye and Ear specimen. **CO-7:** Imparted the knowledge of classification and segregation of biomedical wastes. **CO-8:** Able to deal and manage the biomedical waste generated in the laboratory by treating them before disposal and perceive the knowledge regarding its proper disposal method.
Mapping between COs and PSOs	

Course Content

1. Collection of Blood by Venipuncture
2. Collection of Blood by Capillary puncture
3. Preparation of Plasma
4. Preparation of Serum
5. Collection of laboratory specimens: Urine, Stool, Sputum, Throat and Mouth specimen, Urogenital specimen, Pus, Eye and Ear specimen
6. Storage and Transportation of laboratory specimens: Urine, Stool, Sputum, Throat and Mouth specimen, Urogenital specimen, Pus, Eye and Ear specimen
7. Segregation of BMW
8. Treatment and Disposal of BMW

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, Volume 1/ 3rd	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1/ 2nd	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Technology Methods and Interpretations, Volume 1/ 6th	Ramnik Sood	Jaypee Brothers Medical Publishers (P) LTD
4	Elementary Microbiology, fundamentals of Microbiology, Volume-1	H. A. Modi	Akta Prakashan
5	Experimental Microbiology, Volume 1&2	Rakesh Patel	Aditya Pub

MLTP-MJ-202: PRACTICALS BASED ON LABORATORY INSTRUMENTS AND EQUIPMENTS

<table>
<tr><td colspan="2">Semester: II</td></tr>
<tr><td>Course Code</td><td>MLTP-MJ-202</td></tr>
<tr><td>Credit</td><td>01</td></tr>
<tr><td>Teaching Hour/ Week</td><td>2 Hours</td></tr>
<tr><td>Subject Title</td><td>Practicals Based On Laboratory Instruments And Equipments</td></tr>
<tr><td>Course Objective</td><td>• The students will learn to operate various basic laboratory instruments and equipments like pH meter, colorimeter, centrifuge, weighing balance.
• They will come to know practically how to measure the pH, operate pH meter, adjust the pH of various solutions according to the requirement.
• To make them learn the the principle of of dry and moist heat sterilization by hot air oven and autoclave.</td></tr>
<tr><td>Course Outcome</td><td>At the end of course students will
CO-1: Be trained to measure the pH of any solutions by employing different methods to determine the pH.
CO-2:Be able to operate the pH meter by understanding the concepts of electrodes used to measure the pH.
CO-3: Perform measuring the pH of various solutions and adjust the pH of the solutions as per their requirement u[to the desired range.
CO-4-6:Be operating basic instruments and equipments of laboratory like colorimeter, centrifuge and weighing balance.
CO-7: Employ the concept of dry heat sterilization by using hot air oven for drying and sterilizing various glassware and equipments.
CO-8: Execute the concept of moist heat sterilization by using autoclave for sterilizing various medias, glasswares and other equipments.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td>
<table>
<tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td><td>PSO6</td><td>PSO7</td><td>PSO8</td><td>PSO9</td><td>PSO10</td></tr>
<tr><td>CO1-3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO4-8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
</table>

Course Content

1. Different Methods for Measurement of pH
2. Operation of pH meter
3. Adjustment of pH by pH meter.
4. Operation of colorimeter
5. Operation of centrifuge
6. Operation of weighing balance
7. Sterilization by Hot air oven
8. Sterilization by autoclave

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, Volume 1/ 3rd	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1/ 2nd	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Technology Methods and Interpretations, Volume 1/ 6th	Ramnik Sood	Jaypee Brothers Medical Publishers (P) LTD
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5	Experimental Microbiology, Volume 1&2	Rakesh Patel	Aditya Pub

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
B. Sc. Medical Laboratory Technology
Minor Elective Course Structure of Semester I & II

SEMESTER – I							
Course Code	**Title of The Course**	**Course Credit**	**Hrs. Per Week**	**Internal Exam Marks (CCE)**	**External Exam Marks (SEE)**	**Total Marks**	**Duration of External Exam (Hr.)**
MLT-ME-101	Instruments and Equipments of Medical Laboratory	02	02	25	25	50	01
MLTP-ME-101	Practicals Based on Instruments and Equipments of Medical Laboratory	02	04	25	25	50	06
SEMESTER – II							
MLT-ME-201	Laboratory Specimens and Biomedical Waste Management	02	02	25	25	50	01
MLTP-ME-201	Practicals Based on Laboratory Specimens and Biomedical Waste Management	02	04	25	25	50	06

SEMESTER I

MLT-ME-101: INSTRUMENTS AND EQUIPMENTS OF MEDICAL LABORATORY

Semester: I	
Course Code	MLT- ME -101
Course Title	Instruments and Equipments of Medical Laboratory
Course Type	Minor
Credit	2
Course Level	100-199
Teaching Hour/ Week	2 Hours
Teaching Time	15×2= 30 Hours
Course Objectives	• This course equips students with the knowledge of different instruments used in a clinical laboratory. • It teaches students about the principle, working and applications of the various instruments. • It helps to understand the different types of laboratory glasswares, its cleaning and its calibration.
Course Outcome	At the end of the course, the students will get knowledge of **CO1 -** Component and use of basic laboratory instruments, Working Principle, components, operation and use of various sterilizing equipments like Autoclave, Hot air oven. **CO2 -** Different types of glasswares, plasticwares and other accessories used in clinical laboratory, its use, calibration and cleaning.
Mapping between Cos and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1										
CO2										

Course Content:

Unit No.	**Content**	**Teaching Hours**
Unit-1	**Laboratory Instruments: Principle, Component, Use, Care and maintenance**	**15 Hr.**
1.1	pH meter	
1.2	Colorimeter	
1.3	Centrifuge	
1.4	Instruments of Sterilization: Autoclave and Hot Air Oven	
Unit-2	**Laboratory Equipments**	**15 Hr.**
2.1	Introduction to Laboratory wares: Glassware, Plastic wares and Accessories	
2.2	Calibration of Glassware	
2.3	Cleaning of Glassware	
2.4	Care and Maintenance of Glassware	

Reference Books:

Sr. No.	**Title/Edition**	**Authors**	**Publisher**
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi

	Diagnostic tests, Volume 1, 2nd Edition		
3	Medical Laboratory Science - Theory and Practice	K. Ochei & A Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi
4	Elementary Microbiology, Fundamentals of Microbiology, Vol-1	H.A. Modi	Akta Prakashan, Nadiad
5	Prescott's Microbiology, 10th edition	Willey. J.M, Sherwood L.M and Woolverton C.J., (2017)	McGraw- Hill Education
6	Manual of Basic Techniques for a Health Laboratory	WHO	World Health Organization (2003)

MLTP-ME-101: PRACTICALS BASED ON INSTRUMENTS AND EQUIPMENTS OF MEDICAL LABORATORY

Semester: I	
Course Code	MLTP-ME-101
Course Title	Practicals Based on Instruments and Equipments of Medical Laboratory
Teaching Time	30×2=60 Hours
Course Objectives	• This course equips students with the knowledge of different instruments used in a clinical laboratory. • It teaches students about the principle, working and applications of the various instruments. It helps to understand the different types of laboratory glasswares, its cleaning and its calibration.
Course Outcome	At the end of the course, the students will able to understand in **CO1 to CO8 -** Identify and know the use of different glassware, know cleaning procedure as well as calibration of glassware, Operate various basic instruments and equipments of laboratory

Mapping between Cos and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1-8										

Course Content

1. Study of Laboratory Glassware
2. Cleaning of Laboratory Glassware
3. Calibration of 1 ml, 5 ml pipette
4. Operation of pH meter
5. Measurement and adjustment of pH by pH meter.
6. Operation of colorimeter
7. Operation of Centrifuge
8. Sterilization by Hot air oven and autoclave

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
5	Elementary Microbiology, Fundamentals of Microbiology, Vol-1	H.A. Modi	Akta Prakashan, Nadiad

SEMESTER II
MLT-ME-201: LABORATORY SPECIMENS AND BIOMEDICAL WASTE MANAGEMENT

Semester: II	
Course Code	MLT-ME-201
Course Title	Laboratory Specimens and Biomedical Waste Management
Course Type	Minor
Credit	2
Course Level	100-199
Teaching Hour/ Week	2 Hours
Teaching Time	15×2= 30 Hours
Course Objective	• The students will learn to prepare material and procedure blood collection and get acquainted with the use of vacutainers. • To spread awareness regarding the responsibilities of a phlebolotomist. • To understand the procedure of collection, preservation and transport of blood and urine. • To explain the classification of biomedical wastes and segregate them. • To deal with the disposal of biochemical waste after proper treatment.
Course Outcome	At the end of course **CO-1:**The students will gain knowledge to collect blood and urine specimens. They will also get idea about its storage, preservation and transportation. **CO-2:** The students will learn how biomedical waste is managed. They will be acquiring the knowledge regarding its classification and segregation into categories. They will be able to treat and dispose the BMW properly.

Mapping between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	■									
CO2	■					■	■		■	■

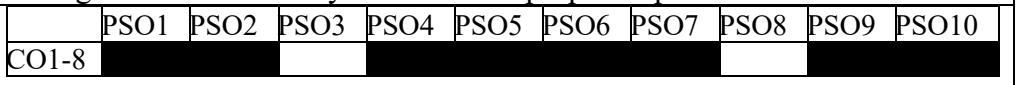
Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Blood and Urine Specimen**	**15 Hr.**
1.1	Preparation of material and patient for blood collection	
1.2	Vacutainer system	
1.3	Responsibilities of a Phlebotomist	
1.4	Collection, Processing, Storage and Transportation of blood	
1.5	Urine: Container for collection, Collection method and types: Collection for a) Screening b) Quantitative analysis c) Bacteriological examination d) Special collection Techniques, Preservation, Storage and Transportation	
Unit-2	**Biomedical Waste Management**	**15 Hr.**
2.1	Introduction and Classification	
2.2	Segregation of BMW	
2.3	Treatment of BMW	
2.4	Disposal of BMW	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd ed., (2014)	Godkar P. B.	Bhalani Publishing House.
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Clinical Diagnosis and Management by Laboratory Methods/17th	John Bernard Henry	W. B. Saunders Company
4	Medical Microbiology and Parasitology/4th	B. S. Nagoba Asha Pichare	ELSEVIER

MLTP-ME-201: PRACTICALS BASED ON INSTRUMENTS AND EQUIPMENTS OF MEDICAL LABORATORY

Semester: II	
Course Code	MLTP-ME-201
Course Title	Practicals Based on Instruments and Equipments of Medical Laboratory
Teaching Time	30×2=60 Hours
Course Objective	• To make students learn to collect blood by different methods. • To give them knowledge about collection of urine specimen. • To practically make then learn how to separate serum and plasma from blood. • To give then idea about various anticoagulants, its mode of action, use of vacutainers and its significance in the field of MLT. • To emphazise proper management of laboratory waste generated by classifying them into various categories and treating them properly before its disposal.
Course Outcome	At the end of course students will **CO-1:**Achieve knowledge of various anticoagulants and their significance during blood collection. **CO-2:**Get familiar with the use of vacutainer system and ease of work by using it. **CO-3:**Will be trained to collection blood using venipunture technique. **CO-4:**Will be trained to collection blood by capillary puncture. **CO-5-6:** Will be able to separate plasma and serum from blood. **CO-7:**It will impart idea about various collection methods for urine specimen. **CO-8:**This section will help students to acquire the knowledge of management of laboratory waste and its proper disposal.
Mapping between COs and PSOs	

Course Content

1. Study of Anticoagulants and Preparation of Anticoagulated Bulb
2. Study of Vacutainers
3. Venipuncture Technique
4. Capillary Puncture Technique
5. Separation of Plasma
6. Separation of Serum
7. Urine Specimen Collection
8. Biomedical Waste Disposal

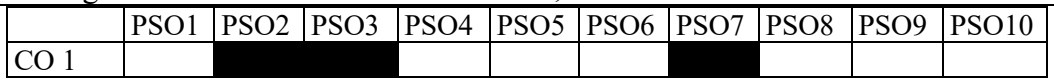
Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd ed., (2014)	Godkar P. B.	Bhalani Publishing House.
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Clinical Diagnosis and Management by Laboratory Methods/17th	John Bernard Henry	W. B. Saunders Company
4	Medical Microbiology and Parasitology/4th	B. S. Nagoba Asha Pichare	ELSEVIER

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
Skill Enhancement Course Structure of Semester I & II

Semester & Course Code	Course Title	Credit	Teaching duration per Week (in Hr.)	External (Marks) (SEE)	Exam Time Duration	Internal (Marks) (CCE)	Total (Marks)
I MLT-SEC-101	Solution Preparation and Laboratory Calculations	01	01	13	00:30	12	25
MLTP-SEC-101	Practicals Based on Solution Preparation and Laboratory Calculations	01	02	13	03	12	25
		Total	**03**	**26**		**24**	**50**
II MLT-SEC-201	Clinical Specimen and Record Keeping	01	01	13	00:30	12	25
II MLTP-SEC-201	Practicals Based on Clinical Specimen and Record Keeping	01	02	13	03	12	25
		Total	03	26		24	50
OR							
II MLT-SEC-202	Phlebotomy	01	01	13	00:30	12	25
II MLTP-SEC-202	Practical Based on Phlebotomy	01	02	13	03	12	25
		Total	**03**	**26**		**24**	**50**

SEMESTER - 1
MLT-SEC-101: SOLUTION PREPARATION AND LABORATORY CALCULATIONS

SEMESTER – I	
Course Code	MLT-SEC-101
Course Title	Solution Preparation and Laboratory Calculations
Course Type	Skill Enhancement Course
Credit	1
Course Level	100-199
Teaching Hour/ Week	1 hr.
Teaching Time	15 hr.
Course Objectives	• This course equips students with the knowledge of different types of solutions used in a clinical laboratory. • It teaches students about the preparation of various types of solutions, buffers and reagents. • It helps to understand the units of measurements used universally
Course Outcome	At the end of the course, the students will get knowledge of **CO1 -** Different types of solution and its preparation, Dilution of solution and finding concentration of unknown solution, units of measurements.
Mapping between Cos and PSOs	

Course Content:

Unit No.	**Content**	**Teaching Hours**
Unit-1	**Laboratory Solution Preparation**	**15 Hr.**
1.1	Introduction: Solute, Solvent, Solution and its types and Basic Requirements for Solution Preparation	
1.2	Expression of Solution Concentration	
1.3	Preparation of Solution: Normal Solution, Molar Solution, Percent Solution, Primary and Secondary Standard Solution	
1.4	Buffer and Indicator: Preparation and Use	
1.5	Units of Measurements	
1.6	Finding concentration of solution after mixing two different concentrated solution	

Reference Books:

Sr. No.	**Title/Edition**	**Authors**	**Publisher**
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Science - Theory and Practice	Ochei & A Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi
4	Textbook on Bio-Chemistry for DMLT & Paramedical Courses	Dr. I Clement	Emmess Medical Publishers

MLTP-SEC-101: PRACTICALS BASED ON SOLUTION PREPARATION AND LABORATORY CALCULATIONS

Semester: I	
Course Code	MLTP-SEC-101
Credit	01
Teaching Hour/ Week	2 Hours
Course Title	Practicals Based on Solution Preparation and Laboratory Calculations
Course Objectives	• This course equips students with the knowledge of different types of solutions used in a clinical laboratory. • It teaches students about the preparation of various types of solutions, buffers and reagents. • It helps to understand the units of measurements used universally
Course Outcome	At the end of the course, the students will get knowledge of • **CO1 to CO6 -** preparation of different types of solution, dilution of solutions and finding concentration of unknown solution.
Mapping between Cos and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1- 6										

Course Content

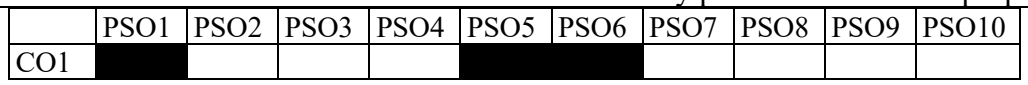
1. Preparation of Normal and Molar Solution (HCL, H_2SO_4, NaOH)
2. Preparation of Percent Solution
3. Preparation of Primary and Secondary Standard Solution
4. Preparation of Phosphate Buffer
5. Working Solution Preparation from Stock Solution (Single dilutions)
6. Serial Dilution Technique

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Science - Theory and Practice	Ochei & A Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi
4	Textbook on Bio-Chemistry for DMLT & Paramedical Courses	Dr. I Clement	Emmess Medical Publishers

SEMESTER - 2

MLT-SEC-201: CLINICAL SPECIMEN AND RECORD KEEPING

SEMESTER – II	
Course Code	MLT-SEC-201
Course Title	Clinical Specimen and Record Keeping
Course Type	Skill Enhancement Course
Credit	1
Course Level	100-199
Teaching Hour/ Week	1 hr.
Teaching Time	15 hr.
Course Objective	• To learn collection, processing, transport and storage of major clinical specimens. • To make students aware about discarding the clinical specimens. • To prepare the report of the results. • Learn to maintain the records of the tests.
Course Outcome	At the end of course students will **CO-1**:Aquire knowledge about collection, processing, transport and storage of major clinical specimens like blood, urine, stool, sputum, pus, etc. This section will also provide them essential knowledge regarding discarding of various clinical specimens after their use. Not omly that the students will learn to prepare reports of the results and maintain the records of the results and laboratory personnel for future purpose.
Mapping between COs and PSOs	

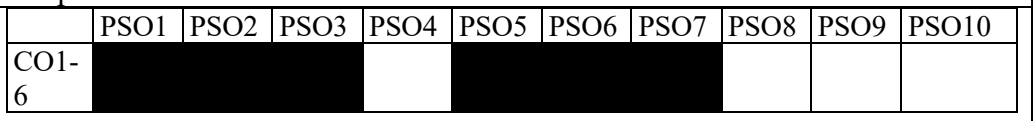
Course Content:

Unit No.	**Content**	**Teaching Hours**
Unit-1	**Collection and Processing of Major Laboratory Specimens**	**15 Hr.**
1.1	Blood	
1.2	Urine	
1.3	General Consideration for Transport and Storage of Specimen	
1.4	Discarding of Specimen After Use	
1.5	Record Keeping: Clinical Laboratory Records and Record of Laboratory Personnel	

Reference Books:

Sr. No.	**Title/Edition**	**Authors**	**Publisher**
1	Medical Laboratory Technology - (Volume 1)/3rd	Kanai L Mukherjee Anuradha Chakravarthy	Mcgraw Hill Education (India) Private Limited
2	Text Book of Medical Laboratory Technology (Volume-1)/3rd	P. B. Godkar D. P. Godkar	Bhalani Publishing House
3	District Laboratory Practice in Tropical Countries (Volume 1)/2nd	Monica Cheesbrough	Cambridge University Press.

MLTP-SEC-201: PRACTICALS BASED ON CLINICAL SPECIMEN AND RECORD KEEPING

Semester: II	
Course Code	MLTP-SEC-201
Credit	01
Teaching Hour/ Week	2 Hours
Course Title	Practicals Based on Clinical Specimen and Record Keeping
Course Objective	• To make the students practice about blood collection by capillary puncture and venipuncture technique. • To impart knowledge about collection techniues for urine specimen. • Give them practice of filling the laboratory forms and storing the reports.
Course Outcome	At the end of course students will be **CO-1:** Trained for collecting blood by capillary puncture. **CO-2:** Trained for collecting blood by veni-puncture. **CO-3:**Processing of blood sample. **CO-4:**Learning the various methods to collect urine sample. **CO-5-6:**Learning to report the results and maintain the records of clinical samples.
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1-6										

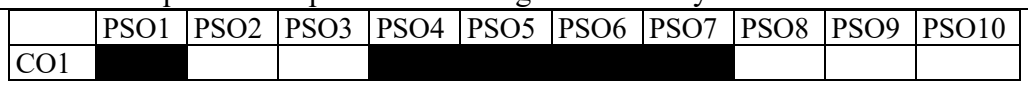
Course Content

1. Collection of Capillary Blood
2. Collection of Venous Blood
3. Blood sample processing
4. Collection of Urine
5. Sample copies of Laboratory Forms
6. Sample copies of Laboratory Records

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Medical Laboratory Technology - (Volume 1)/3rd	Kanai L Mukherjee Anuradha Chakravarthy	McGraw Hill Education (India) Private Limited
2	Text Book of Medical Laboratory Technology (Volume-1)/3rd	P. B. Godkar D. P. Godkar	Bhalani Publishing House
3	District Laboratory Practice in Tropical Countries (Volume 1)/2nd	Monica Cheesbrough	Cambridge University Press.

MLT-SEC-202: PHLEBOTOMY

SEMESTER – II	
Course Code	MLT-SEC-202
Course Title	Phlebotomy
Course Type	Skill Enhancement Course
Credit	1
Course Level	100-199
Teaching Hour/ Week	1 hr.
Teaching Time	15 hr.
Course Objective	• To bring awareness regarding the role of a phlebotomist. • To develop the theoretical knowledge of blood collection and various types anticoagulants used during collection & their mode of action. • To learn the significance of vacutainer system, its types and operation.
Course Outcome	At the end of course students will get knowledge of **CO-1:** Role of a phlebotomist and his responsibilities in a clinical laboratory. They will gain knowledge regarding various specimens, anticoagulants and its use. They will also acquire the importance of using vacutainer system.
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1										

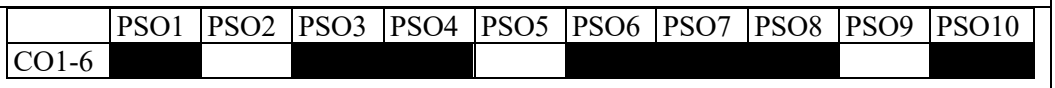
Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Phlebotomy: Training the Technician**	**15 Hr.**
1.1	Assessment of Competence of Laboratory Work	
1.2	Preparation of Blood collection materials and Preparation of Patient	
1.3	Responsibilities of A Phlebotomist	
1.4	Specimen Types and Anticoagulant	
1.5	Vacutainers	
1.6	Phlebotomy	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Science - Theory and Practice	Ochei & A Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi

MLTP-SEC-202: PRACTICALS BASED ON PHLEBOTOMY

Semester: II	
Course Code	MLTP-SEC-202
Credit	01
Teaching Hour/ Week	2 Hours
Course Title	Practicals Based on Phlebotomy
Course Outcome	At the end of the course, the students will get knowledge of • Anticoagulants and its use • Types of Vacutainers • Collection procedure of Blood • Processing of Blood
Course Objective	• To train students to collect blood by different methods. • To impart knowledge of anticoagulants. • To make them learn to separate serum and plasma from blood. • To explain the stability of specimens • To emphasize good laboratory practice to avoid preanalytical errors.
Course Outcome	At the end of course students will get knowledge of **CO-1:** Gain knowledge about the types of anticoagulants and its and use. **CO-2:** Practice various methods of blood collection. **CO-3-4:** Practically conduct the separation of serum and plasma from blood. **CO-5:** Will get idea about stability of various specimens arriving the laboratory for analysis. **CO-6:** How the pre-analytical errors can occur and how to avoid them.
Mapping between COs and PSOs	

Course Content

1. Study of Anticoagulants
2. Phlebotomy: Venipuncture, Skin Puncture and Arterial Puncture
3. Separation of Plasma
4. Separation of Serum
5. Study of Specimen Stability
6. Preanalytical Errors

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Science - Theory and Practice	Ochei & A Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
Multidisciplinary Course Structure of Semester I & II

Semester & Course Code	Course Title	Credit (Theory)	Teaching duration per Week (in Hr.)	External (Marks) (SEE)	Exam Time Duration	Internal (Marks) (CCE)	Total (Marks)
I MLT-MDC-101	Organization of Clinical Laboratory	4	4	50	02	50	100
II MLT-MDC-201	Nutrition and Health	4	4	50	02	50	100

MLT-MDC-101: ORGANIZATION OF CLINICAL LABORATORY

SEMESTER – 1	
Course Code	MLT-MDC-101
Course Title	Organization of Clinical Laboratory
Course Type	Multidisciplinary Course
Credit	4 (Theory)
Course Level	100-199
Teaching Hour/ Week	4 Hours
Teaching Time	15×4= 60 Hours
Course Objective	• To understand the various aspects of a medical laboratory, its organization. • To understand proper techniques for specimen handling and processing so as to obtain accurate results • To understand the importance of Quality control and Quality assurance. • To understand the role and functions of accreditation,
Course Outcome	At the end of the course, the students will get knowledge of **CO1 -** Basics of clinical laboratory, Ethics and Code of safe laboratory practice. **CO2 -** Basics of clinical laboratory organization, Standard clinical laboratory set up and types of Laboratories. CO3 – Accreditation in clincal laboratory, types and role of NABL. **CO4 -** Laboratory hazards and safety, First-Aid in clinical laboratory, Biosafety levels and Biosafety programs.

Mapping between Cos and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	■	■					■			
CO2				■	■					
CO3			■	■		■				
CO4	■	■								

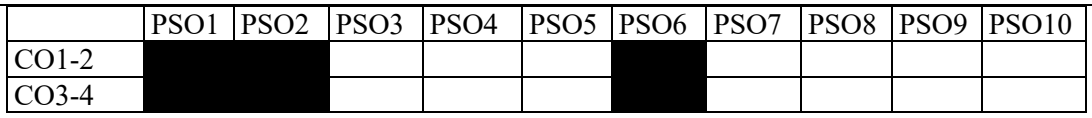
Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Human Health and Clinical Diagnosis in Developing Countries**	**15 Hr.**
1.1	Medical Care in India	
1.2	Status of Medical Laboratories in Developing Countries	
1.3	Commonly Requested Laboratory Tests	
1.4	Role of Medical Laboratory Technologist, Ethics and Code of Conduct	
Unit-2	**Laboratory Organization**	**15 Hr.**
2.1	Organization of Laboratory	
2.2	Functional Components and Role of Individual Components of Laboratory	
2.3	Various types of Laboratories	
2.4	A Standard Clinical Laboratory Set up	
Unit-3	**Accreditation of Medical Laboratory: NABL**	**15 Hr.**
3.1	Introduction and scope	
3.2	Aims and objectives	
3.3	Description and types of laboratory	
3.4	Qualification norms	
Unit-4	**Laboratory Accidents and Safety**	**15 Hr.**
4.1	Laboratory Hazards- Physical, Chemical and Biological, Accidents and Safety Measures in Clinical Laboratory	
4.2	First Aid in Laboratory	
4.3	Biosafety Level and Biosafety Programme	
4.4	Biomedical Waste Management	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1, 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Medical Laboratory Science - Theory and Practice	L. Ochei & A Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi
4	District Laboratory Practice in Tropical Countries, Part 1, 2nd Edition	Monica Cheesbrough	Cambridge University Press
5	Medical Laboratory Technology Methods and Interpretations, Volume 1, 6th Edition	Ramnik Sood	Jaypee Brothers Medical Publishers (P) LTD
6.	https://www.nabl-india.org>2019/02		

SEMESTER – 2
MLT-MDC-201: NUTRITION AND HEALTH

SEMESTER – 2	
Course Code	MLT-MDC-201
Course Title	Nutrition and Health
Course Type	Multidisciplinary Course
Credit	4 (Theory)
Course Level	100-199
Teaching Hour/ Week	4 Hours
Teaching Time	15×4= 60 Hours
Course Objective	• To emphasize the significance of nutrition in Health and Wellness. • To explain the factors affecting food and nutrition. • To make them aware of RDA and how a balanced diet should be. • To get a knowledge of measuring the energy requirements and calculating BMR, BMI. • To give knowledge on various Nutritional Disorders.
Course Outcome	At the end of course students will **CO-1:** Develop the concept of macronutrients, micronutrients and nutritional requirements to attain energy. They will be able to explain the Nutritional significance of Carbohydrate, Lipid, Protein, Minerals and Vitamin in day to day life. **CO-2:** They will gain knowledge regarding energy requirements of various individuals. They will be learn how man utilises such nutritional energy and how to evaluate the BMR and BMI of individuals. **CO-3:** Through this section they will study the impact of nutrition on mental and physical health of humans. They will get idea about certain factors that affect food and nutrition. They will learn how to design a proper Balanced diet by knowing all the daily recommended allowances of all the essential substances required to sustain. **CO-4:** Get awareness about various nutritional disorders and obesity due to major nutritional disturbances which may be either through increase or decrease of any substances in their diet.
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1-2										
CO3-4										

Course Content:

Unit No.	**Content**	**Teaching Hours**
Unit-1	**Nutrition**	**15 Hr.**
1.1	Introduction	
1.2	Nutrients: • Macronutrients and Micronutrients • Organic and Inorganic Nutrients Energy Yielding and Non-Energy Yielding Nutrients	
1.3	Nutritional Importance of Nutrients: Carbohydrate, Lipid, Protein, Minerals and Vitamin	
Unit-2	**Energy**	**15 Hr.**

2.1	Nutrition and Energy supply	
2.2	Utilization of Energy in Man	
2.3	Energy Requirements for Different Categories of People	
2.4	Measurement of Energy count of food	
2.5	Body Mass Index and Basal Metabolic Rate	
Unit-3	**Health**	**15 Hr.**
3.1	Introduction and Factor affecting Physical and Mental Health	
3.2	Role of Nutrition in Maintaining Health	
3.3	Factors Affecting Food and Nutrition	
3.4	Recommended Dietary Allowance and Balanced Diet	
Unit-4	**Nutritional Disorders**	**15 Hr.**
4.1	Protein-Energy Malnutrition	
4.2	Kwashiorkor	
4.3	Marasmus	
4.4	Nutritional Anaemia	
4.5	Obesity	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Anatomy & Physiology in health & illness,11th edition, (2014)	Ross & Wilson	Elsevier Publications
2	Textbook of Physiology for MLT, 1st edition (2016)	A. K. Jain	Avichal Publishing Company
3	Biochemistry/ 4th	Satyanarayana U. & Chakrapani U	Arunabha Sen and Allied (P) Ltd
4	Textbook of Medical Biochemistry/ 8th	Chatterjea M. N. and Shinde R.	JaypeeBrothers Publishers
5	Textbook of Applied Biochemistry and Nutrition & Dietetics for Nursing Students	Harbans Lal	CBC Publishers and Distributors Pvt. Ltd